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College Act, which might properly be a part of a national university.

No greater boon has come to some of our universities, for example, those in Wisconsin, Illinois and Minnesota, which have secured means for such large service, than has come through college extension departments to serve those not resident in schools, to the mature farmer, mechanic and home maker. And the federal government already has in hand a stupendous work of this kind in its bureaus of farm demonstration and farm management. A national university, with its regency in part nominated by the great federated bodies of societies representing all phases of industry, home-making, education and art, might here have its greatest function. Mr. Bush-Brown's idea of a people's education foundation under the auspices of such a board would probably grow into a vastly greater work than the service to students resident in Washington.

Such a foundation could federate with all the private foundations, the national and state bureaus of education, the educational institutions of all states and the federated bodies supplying members to the regency for the most effective educational service. Under its guidance our educational machine (shown by the Carnegie Foundation and the General Education Board to be so disjointed and poorly coordinated) would be made vastly more efficient. Private fortunes would come to such a foundation, with its semipublic plan of control, and at the same time congress might find reason to provide liberally for its needs along all lines clearly meeting public demands.

It is manifest that this subject needs more discussion. The possibilities are so very large that wide consideration should be given that the more essential factors be brought boldly to the forefront. A move now to establish a university will make a new era in higher education. But one of its chief lines of work should be to foster vocational education for all the people in the lower schools. The better the lower schools are in giving efficiency to the producing classes, the more financial support and the more well-prepared students will come to all universities. But that is a small consideration beside the one of providing vocational education just below those rounds of the educational ladder from which the masses actually do and will leave to enter the work of producing and home-making. A board of regents in large part selected by and from the various classes of people, and a public educational foundation, supplied with means through which such a regency can reach and guide and build up the masses, will make not a Washington institution, but a national university; not a campus college but a university spread all over Uncle Sam's domain; and may become a beneficent world foundation to help take our freedom, our ideals and our opportunities to all the people in all the world.

WILLET M. HAYS

UNDERGRADUATE RESEARCH WORK IN MEDICAL SCHOOLS

IT has undoubtedly become true that a man with a real desire to gain all he can from his four years in the better type of American medical school can not be free very long from the idea that he must know something of the methods of investigation in medicine, or else graduate lacking an important element in his training. I am not referring to the man who feels he will favor the world with a cure for cancer as soon as his osteology course is finished, but to the steady well-prepared workers who make up the first third of every medical class. These men find themselves launched

on a traditionally inspiring sea. They are far too acute not to know that their strongest leaders are the imaginative, productive spirits in their new life and they want to follow the best. It is not amiss for such men to feel they have a right to gain some notion of what investigation entails. Such information is gathered to some extent in the laboratories of the first and second years, but in most instances it is to a very small extent. The doing of fixed experiments in fixed hours does not entail the exercise of investigative faculties other than those of the most mechanical nature. The student receives instructions as to the setting up of apparatus and the preparation of his material. If he follows these faithfully and accurately he is reasonably certain of gathering the data for the necessary conclusions. Perhaps from his primary deductions he is required to generalize some governing principle of the widest application. At best he has had almost no chance for the use of his imagination; he has never learned the meaning of high scientific accuracy. He has no true notion of the difficulty of putting a problem on a working basis. I believe it must be the lack of just such powers which leads to the adverse criticism of so many American students in German universities.

The student more or less realizes these facts and when in his third and fourth years he finds he can get access to the laboratory most attractive to him, he takes his scraps of time and does what he can. Is it worth while to meet him half way?

Six years ago the medical students of the University of Pennsylvania organized the Undergraduate Medical Association, modeled upon the American Medical Association, and having for its constituent parts the numerous medical societies which are a constant part of student life. The organization planned one large meeting a year, when original papers were to be presented. The success of the meetings has varied considerably. This, as will appear later, must necessarily be so. Fourth year men do the largest part of the work, beginning in their third year and finishing the following April. If they are to do anything worth while they must expect to pay the price of slackening in their other work, and it occasionally happens that there are not many men in a class who dare to do this. I do not believe it ever happens that there are not many who would be glad of a chance to do some independent work, but, as a rule, under the circumstances of an inflexible curriculum, there are not enough who dare to carry this to a successful conclusion.

Such men receive all possible encouragement from the faculty, and in reason they are given every facility for their work. But the assistance never takes the vital, practical form of *time to work*. The student investigator must keep abreast of his fellows and do his experiments when he can. With the present medical course this "when" requires considerable research for the discovery of its existence. Since such a situation must unfailingly hamper the activity of the Undergraduate Medical Association it was decided to attempt to better it, and with the encouragement and help of Dr. Allen J. Smith, the dean of the faculty, the following investigation was undertaken.

Twenty-five medical schools were selected as a basis of investigation. It is evident from the lists given that they represent fairly well the various types of effort in the field of medical education. The deans of these schools, with the exception of Johns Hopkins, received the following letter and questions. In the case of Johns Hopkins the letter was sent to Dr. W. H. Howell, and his reply must be

regarded as the expression of a personal opinion rather than an official statement from his school. The deans of two other medical schools, Cornell and the University of Toronto, failed to respond to the first letter, and in these two cases a second letter was sent to selected professors, Dr. James Ewing in the one case, and Dr. J. B. Leathes in the other.

PHILADELPHIA, PA., April 22, 1912

DEAN OF THE MEDICAL DEPARTMENT,

Dear Sir: It is the contention of some of the undergraduates of this school that certain carefully selected men should be given permission and special privileges in the working out of research problems. At the present, while post-graduate research is favored in every way, undergraduates are allowed no deviation from the regular curriculum and little opportunity for original investigation. Before any changes are made in the present system it has been suggested that inquiry be made into the status of undergraduate research work in other schools. With this in view I have prepared the accompanying list of questions, to which I request the favor of a reply, together with any further suggestions or comments which you may care to make.

Thanking you, I am,

Very truly yours,

CECIL K. DRINKER, *Chairman,*
Research Committee of the Undergraduate Medical Association of the University of Pennsylvania

QUESTIONS

1. Do you allow undergraduates to undertake research in conjunction with their regular medical work?

2. Do you give such men any immunity from work in their regular courses?

3. How do you select men for such work—is it done entirely by the department to which they apply or do you have a faculty committee to deal with such applications?

4. Do you believe that the original work turned out by these men justifies the time they have taken from their course?

5. Do you believe that the care your faculty has taken to produce and further such work has resulted in your school turning out effective laboratory men in larger proportion than it would have without such a policy?

DISCUSSION OF THE FIVE QUESTIONS

First Question

Do you allow undergraduates to undertake original research in conjunction with their regular medical work?

Seventeen colleges out of the twenty-five give an affirmative answer to the first question. They are:

1. Albany Medical College.
2. University and Bellevue Hospital and Medical College.
3. University of California.
4. University of Cincinnati.
5. Cornell University.
6. College of Physicians and Surgeons of Columbia University.
7. Harvard University.
8. Johns Hopkins University.
9. University of Michigan.
10. University of Minnesota.
11. Northwestern University.
12. Rush Medical College.
13. Tulane University.
14. University of Virginia.
15. Washington University.
16. Western Reserve University.
17. Yale University.

Eight colleges answer in the negative. They are:

1. Atlanta College of Physicians and Surgeons.
2. Jefferson Medical College (permits in the summer).
3. McGill University.
4. University of North Carolina.
5. University of Pittsburgh.
6. University of Tennessee.
7. University of Texas (permits in the summer).
8. University of Toronto.

Therefore, in all, seventeen schools permit undergraduates to undertake research and eight do not. If we classify all these schools upon the basis selected by Mr. Flexner in the first report of the Carnegie

Foundation on Medical Education, namely upon the possession or lack of a two years' college entrance requirement, we find that of the schools permitting undergraduate research five fail the test:

1. Albany Medical College.
2. University and Bellevue Hospital and Medical College.
3. University of Cincinnati.
4. Tulane University.
5. University of Virginia.

If we examine the other side we find not a single school meeting the Carnegie requirement. Some of the schools giving negative replies make it clear in their letters that they do not indulge in the policy of furthering the research spirit because of the need of the country for "practical men" or "capable family doctors." It is difficult to conceive however of a really "capable family doctor" who can not think scientifically, or of a "practical man" without practical facility in the scientific investigation of his cases.

Question Two

Do you allow such men any immunity from work in their regular courses?

We find only one school, Tulane University, going to the extreme indicated by the question. Their attitude is best explained by extracts from the letter of Dr. Isadore Dyer, the dean.

Answers to questions one and two:

1. Undergraduates in their last three years are encouraged to do original research in conjunction with their regular medical work. As yet there has been no systematization of this kind of work in the Tulane Medical Department and, so far, the men undertaking such work have been compelled to forego a part of their regular curriculum.

2. In the fourth year men are assigned to the laboratories of pathology and clinical medicine as assistants and, in such capacity, are not only permitted but are encouraged to do original work. In their capacity as assistants they are excused from other work which might interfere with such function.

One can not help feeling that a similar condition exists in other schools, but brought about in a different manner. Suppose a medical course contains a certain number of elective hours—elective in the sense that they may be filled by extra routine work in the various subjects of the course or by research. Men must complete a certain number of hours or units to graduate. They are given no "immunity from work in their regular courses," but they do not need it, since they can make a successful research a factor in getting the degree, quite as well as the passing of an examination in some required subject.

The question, therefore, takes a broader basis and becomes: What schools make undergraduate research possible by a concession of hours in the regular roster? Nine schools answer such a question affirmatively. They are:

1. University of California. This school announces that

the more proficient students are encouraged to do advanced work in the line of original research, particularly in anatomy, physiology, pathology and experimental surgery. (Letter of Dr. A. A. D'Ancona.)

The catalogue shows a roster of sufficient elasticity to allow successful work.

2. Harvard University. No free hours are given until the fourth year, when the following arrangement is made.

The electives of the fourth year are given as half-courses and quarter-courses. A half-course occupies the entire day for one month (the all-day plan) or the forenoons or the afternoons for two months (the half-day plan). Each half-course has a value of one hundred and twenty-five hours. Quarter-courses occupy half the day for one month. Two quarter-courses equal a half-course. Eight half-courses are necessary to satisfy the requirements of one thousand hours of work demanded in the fourth year.

Students wishing to specialize in any particular branch of medical studies may elect more than one of the half-courses offered in a given subject, but

no student will be allowed to devote his whole year to one subject without the consent of the head of the department concerned.

When a student's research work in an elective is necessarily prolonged beyond the time elected for that subject, he will be allowed, with the permission of the Administrative Board, to make such changes in his electives as will enable him to finish his research work, provided the time required does not extend beyond the school year. (Catalogue of Harvard University Medical School, 1911–12, p. 55.)

3. Johns Hopkins University. In the first two years we find that

the major portion of the work of these years is obligatory for all students, but the time is so arranged that certain elective courses may be selected; thereby making it possible either to give more time to the obligatory courses, or to do special work along the related lines. When any elective course has been selected it must be completed satisfactorily if credit is to be obtained for it. (Johns Hopkins University Catalogue, 1911–12, p. 116.)

In the third year

on certain afternoons there are also offered a number of short elective courses of a practical character, and each student is required to select from them a sufficient amount of work to give him a credit of one and a half units—the unit for the last two years being defined as a course or group of courses equivalent to six hours a week for one trimester. (Johns Hopkins University Catalogue, 1911–12, p. 117.)

In the fourth year the class is divided into three groups, each working in rotation for one trimester in medicine or surgery, or in certain elective courses. For one third of their time the students are given an opportunity to vary their studies according to their special needs and may choose from a large number of elective courses. (Catalogue, p. 117.) The courses so elected may continue the practical work in medicine, surgery, obstetrics, gynecology, etc., or may bear upon the special branches of medicine, or may be taken in the scientific laboratories. Each student, in other words, after completing certain minimal requirements, chiefly in medicine and surgery, may extend his knowledge by taking a number of short clinical courses in different departments, or he may concentrate his attention upon the work of a few departments. (Catalogue, pp. 118–119.)

A quotation from Dr. Howell's letter is of interest:

The committee controlling the work of the first two years decided also that students who had shown inability to carry the required work successfully, as shown by their marks, should not be permitted to engage in advanced or research work.

4. University of Michigan. In the first year an optional course in topographical anatomy is given from April 15 to the end of the term. At the same time stipulation is made that

students desiring to follow a laboratory career may substitute other work for the latter course by applying to the professor of anatomy. (Michigan Catalogue, 1912–13, p. 25.)

Other opportunities are given in anatomy, introduced by the following paragraph:

It should be pointed out that in addition to the information and technique acquired in their accomplishment, the special study of such problems possesses the additional value of developing independent thought and the work is strongly recommended to all students planning to follow a university or laboratory career. (Michigan Catalogue, 1912–13, p. 28.)

The same principle holds for the three following years. Saturday work is not required except in the third year, and the students are thus given a fair allotment of time for independent work and thought. The letter of Professor Victor C. Vaughan sums up the Michigan attitude:

1. We not only allow, but encourage undergraduates to undertake research work, provided they have good standing in their regular work. They must not, under any circumstances, shirk their regular work in order to do research.

2. We do not give immunity from the routine work to those who do research. During the fourth year there is one period of three months in which the bright student has half the day to do research work. In addition to this, many students do some of their ordinary work in the summer session, and in this way get from six to eight weeks ahead of the class. This time they may devote to research work. (Extracts from letter received May 9, 1912.)

5. Rush Medical College. Elective courses are given in all four years. The quarter system in vogue in this school is so essentially elective and gives such great latitude in the whole school career that it is useless to try to give any adequate notion of how much time a man may be permitted to spend on research.

The letter of Dr. H. Gideon Wells expresses the situation excellently.

> We have always laid the greatest stress on research work by undergraduate students in the medical courses. This is not a new thing, but dates back to 1895. Since that time there have always been several undergraduate students engaged in research, at first chiefly in the department of pathology, but since the university took up medical work eleven years ago, in all departments. We not only permit research by our students but encourage it in every way possible. We even send notices to the colleges throughout the country from which our students come that we offer prizes for undergraduate research work, and I enclose a copy of the same. I am pleased to announce that negotiations are now under way whereby an additional cash prize of $200 will be awarded annually for undergraduate research in pathology or bacteriology.
>
> We do not excuse research men from any of the ordinary courses, but we do not stuff our curriculum so hopelessly full of required work that capable and energetic young men can not find time for original investigations, and commencing next year one quarter is left entirely open for elective work. Our quarter system permits of much elasticity in the curriculum, and a man with the research spirit is usually willing to put in extra quarters at work, the university being open all year. Most of the best men in our first two years do research work or assist in it, and a considerable proportion spend from one to three years extra time between the second and third years of the medical courses, in working for a master's or doctor's degree. I always have a class of from six to ten men who are candidates for the degree of Ph.D., taking either their major or minor in pathology. The men who do the work either request the privilege or are selected by the departments, most of them receiving aid in the form of fellowships or scholarships from the university.

6. Tulane University. Dealt with on page 54.

7. University of Virginia. Here we find that

> opportunities are offered in the fourth year for more extended training in certain subjects with a view towards possible specialization after graduation. (Catalogue University of Virginia, 1911–12, p. 199.)

These opportunities are given in physiology, pathology and bacteriology, and mean six hours a week for half a year. Four students only may be taken in physiology.

An extract from the note of Dr. R. H. Whitehead is as follows:

> Our curriculum is planned for the "average man," and it keeps such a man quite busy; he can hardly do anything else to advantage. But the exceptional man can often undertake some line of investigation with results that are distinctly beneficial to him and creditable to the school.

8. Washington University. Elective courses are given through the four years. Specially qualified students are permitted, at the discretion of the heads of the departments involved, to take up original research instead of these electives. They can obtain units for graduation by means of such work.

9. Yale University. Elective courses are given in all four years. The requirement of a thesis for graduation necessitates a certain amount of open time through the course and men may make original work the basis of the thesis.

Schools permitting research and giving no visible time for it are as follows:

1. Albany Medical College.
2. University and Bellevue Hospital and Medical College.
3. University of Cincinnati.
4. Columbia University.
5. University of Minnesota.
6. Northwestern University.
7. Western Reserve University.

Of these schools Columbia, Minnesota, Northwestern and Western Reserve meet

or more than meet the two years college entrance requirement.

When we add to these the eight schools which do not permit research or allow it only in the summer, namely:

1. Atlanta College of Physicians and Surgeons,
2. Jefferson Medical College,
3. McGill University,
4. University of North Carolina,
5. University of Pittsburgh,
6. University of Tennessee,
7. University of Texas,
8. University of Toronto,

we have grouped the lukewarm and negative side of the whole proposition. Not one of this last group requires two years of college work.

Third Question

How do you select men for such work—is it done entirely by the department to which they apply or do you have a faculty committee to deal with such applications?

Tulane University requires that research men, after being passed upon favorably by the department to which they have applied, obtain the consent of the dean and president of the university. All other schools have the selection in the hands of the departments alone.

Without going into every answer, it may be given as the strong opinion of all the schools that only certain men should be allowed to undertake original investigation. Where there are elective hours which may be filled by research, it is always carefully stated that the selection is controlled by "previous standing," "special fitness," etc., so that those who would probably become unsuccessful investigators are barred from starting and take other elective hours in line with the regular work. The whole policy of furthering undergraduate research is, therefore, levelled at a small number of men, and it is most significant to know that many of our greatest schools find it worth while to pursue such a policy.

My answers to this question emphasize another fact. Research spirit is fostered by example, not by coaxing. Free hours are given which may be filled by research, but permission to so fill them is in the nature of a prize. As Dr. Howell says, "the researchers become marked men," and Dr. Christian,

> The medical curriculum should be elastic enough to allow each student a certain amount of time which he may occupy in accordance with his own ideas. Most students will and should occupy this time in studying a little deeper some of their regular subjects. The occasional student will occupy it in some form of investigation. The latter type of student, I am inclined to think now, finds time for investigation. [Note, page 55, Harvard gives more chance for such students than any other school except Rush.] You can not create such students by any rule. Any systematic move to develop research work among the students appears to me, on the whole, to be farcical, because original investigation is not so produced. No student should be encouraged to neglect his regular work for investigation. The brighter student can do his original work after he has kept pace with his classmates.

This expresses the view which should be taken of the whole matter. It does not come from a school where undergraduate research is forbidden nor where it is made an ornament of the catalogue, but from one which furthers it in every way in the right men. That is the inevitable conclusion from this study—not unlimited, uncontrolled hours, which is the meaning of the word *elective* to most people, but controlled and counted hours for men who must justify their selection or suffer from their failures, just as men must suffer who do not do their work in any one of the prescribed courses.

Question Four

Do you believe that the original work turned out by these men justifies the time that they have taken from their course?

Affirmative answers from:

1. University of California.
2. Johns Hopkins University.
3. University of Michigan.
4. Northwestern University.
5. Rush Medical College.
6. University of Virginia.
7. Washington University.
8. Western Reserve University.
9. Yale University.

The following do not answer the question:

1. Albany Medical College.
2. Atlanta College of Physicians and Surgeons.
3. Jefferson Medical College.
4. Harvard University.
5. University of Minnesota.
6. University of Texas.

Negative answers come from:

1. University and Bellevue Hospital and Medical College.
2. University of Cincinnati.
3. Cornell University.
4. Columbia University.
5. McGill University.
6. University of North Carolina.
7. University of Pittsburgh.
8. University of Tennessee.
9. Tulane University.
10. University of Toronto.

Opinions upon the question from several schools are as follows:

Dr. Howell (Johns Hopkins):

Some men have told me that their experience in research was of the greatest value—an intellectual awakening. I have known of others who have fallen by the wayside and made the instructor himself feel that the time was wasted. On the whole all of us believe in its value, otherwise we would discourage it—not, I fancy, for the value of the scientific results obtained, but for its educational value on the picked men and the belief that the group of the serious workers in medical science will be recruited from this body of students.

Dr. H. Gideon Wells (University of Chicago):

There can be no question as to the value of the work which has been turned out by our undergraduate investigators, but that is a very secondary consideration compared with the influence on the men themselves.

Dr. Victor C. Vaughan (University of Michigan):

Some very good original research has been done by our undergraduates. We have what we call the Junior Research Club, made up principally of assistants and students and encouraged by members of the faculty.

Dr. I. H. Manning (University of North Carolina):

In my judgment the student is unprepared to do creditable original work.

Fifth Question

Do you believe that the care your faculty has taken to produce and further such work has resulted in your school turning out effective laboratory men in larger proportion than it would have without such a policy?

Affirmative answers come from:

1. University of California.
2. Harvard University.
3. Johns Hopkins University.
4. University of Michigan.
5. Rush Medical College.
6. University of Virginia.
7. Washington University.
8. Western Reserve University.
9. Yale University.

Schools giving no answer are as follows:

1. Albany Medical College.
2. Atlanta College of Physicians and Surgeons.
3. University and Bellevue Hospital and Medical College.
4. University of Cincinnati.
5. Jefferson Medical College.
6. University of Minnesota.
7. University of North Carolina.
8. Northwestern University.
9. University of Texas.
10. Tulane University.

In regard to Tulane the answer of Dr. Dyer is as follows:

The policy above indicated has been too recent to justify any reply to your fifth question, but it is my personal belief that the sympathy of the faculty with the research spirit in students is bound to make better laboratory men. More than

this the demand for men trained in the laboratories as now obtains in the south and will obtain hereafter, makes it more than a policy for the future.

Schools answering in the negative are:

1. Cornell University.
2. Columbia University.
3. McGill University.
4. University of Pittsburgh.
5. University of Tennessee.
6. Washington University.

Certain interesting opinions are as follows:

Dr. Howell (Johns Hopkins):

I have no doubt whatever that the custom as it exists in our school has been responsible in determining the course of a large proportion of our men who have subsequently undertaken investigation as a life work.

Dr. Vaughan (University of Michigan):

I am quite sure that the encouragement given to our brighter students to do research work has resulted in drawing out many more effective laboratory men than would have been the case had we not encouraged research.

Dr. H. Gideon Wells (University of Chicago):

Nearly all the investigators who have graduated from Rush Medical College have done undergraduate research work, and I would criticize your question 5 to the extent of saying that the research work turns out more efficient practitioners as well as laboratory men, for a practitioner should look on each case as a problem for investigation and approach it with the same spirit that a laboratory man approaches his problem.

Dr. George Dock (Washington University, St. Louis):

Probably yes, but it is impossible to say positively. The fact that graduates are active investigators should stimulate just as many men to take up laboratory careers after graduation. In some cases premature work in investigation has kept men from getting a good grounding.

Dr. Samuel W. Lambert (Columbia):

I doubt very much if any special results can be traced to such a course.

In summing up the whole matter, I think it is evident that there is a decided tendency in the foremost schools to give time in the curriculum for independent work and thought, and the tendency to turn certain men to a laboratory life as well as to the better type of medical practise. Dr. Lambert, in replying for Columbia, one of the schools giving a pronounced negative throughout, adds to his letter:

I would here state that the committee on scholarships recently recommended to the faculty beginning next fall, "that four awards of $350 be made to undergraduate students; that holders of these scholarships be assigned as student assistants, two to the department of anatomy and two to the department of physiology, and that they shall render such services to the said department as may be assigned them by their respective heads."

This does not mean original work, but it does point to a method of making men better acquainted with the laboratory and giving them a chance to learn their own fitness for such work.

It is also evident that only a very limited number of carefully selected men should be allowed to do research work and that such work should be permitted to count for the degree. There is a practical unanimity of opinion that no man should be allowed to slight his regular work for research, and since he is working for a degree he should have quite as great a responsibility toward his research if he is given the privilege of entering upon it.

The amount of time which different schools give is varied, so varied that no estimation can be made of what is fair. It is obvious, too, that mere numbers of hours mean little, since a small number of consecutive hours may easily be of more use than a large number hopelessly scattered, which never permit more than the hurried starting of experiments and bring no satis-

faction either to the student or his professor.

Finally the belief may be emphasized that experience in actual investigation must be of immense benefit to the student who wishes to approach medicine in the scientific spirit which the times demand. The use of sphygmographic tracings, blood-pressure determinations, and quantitative chemical analyses as every-day aids in the elucidation of a diagnosis requires a mind trained to think in such terms. This is the reason the student turns to the laboratory. He wishes to find out how problems of investigation are approached in order that he may make successful problems of his cases. If, as Dr. Howell believes, "the group of serious workers in medical science will be recruited from this body of students," from the men who, in the words of Dr. Wells, will approach each case "in the same spirit that a laboratory man approaches his problems"—then surely it is worth while to make room in the curriculum for their growth.

Cecil K. Drinker
University of Pennsylvania

SCIENTIFIC NOTES AND NEWS

The council of the Royal Society has made awards as follows: A Royal medal to Professor William Mitchinson Hicks, F.R.S., for his researches in mathematical physics and investigations on the theory of spectroscopy. A Royal medal to Professor Grafton Elliot Smith, F.R.S., for his researches on the comparative anatomy of the brain. The Copley medal to Professor Felix Klein, of Göttingen, For.Mem.R.S., for his researches in mathematics. The Rumford medal to Professor Heike Kamerlingh Onnes, of Leyden, for his researches at low temperatures. The Davy medal to Professor Otto Wallach, of Göttingen, for his researches on the chemistry of the essential oils and the cyclo-olefines. The Darwin medal to Dr. Francis Darwin, F.R.S., for his work in conjunction with Charles Darwin, and for his researches in vegetable physiology. The Buchanan medal to Colonel William C. Gorgas, of the United States Army, for his sanitary administration of the works of the Panama Canal. The Hughes medal to Mr. William Duddell, F.R.S., for his investigations in technical electricity.

The council of the Royal Society has made nominations for the year 1913 as follows: *President,* Sir Archibald Geikie; *Treasurer,* Sir Alfred B. Kempe; *Secretaries,* Sir John Bradford, Professor A. Schuster; *Foreign Secretary,* Dr. D. H. Scott; *Other Members of the Council,* Lieut.-Col. A. W. Alcock, Mr. A. J. Balfour, Sir William Crookes, Dr. F. W. Dyson, Professor W. Gowland, Sir Joseph Larmor, Professor E. W. MacBride, Mr. W. B. Hardy, Professor Micaiah J. M. Hill, Sir Ronald Ross, Professor G. Elliot Smith, Professor A. Smithells, Dr. J. J. Harris Teall, Professor Silvanus P. Thompson, Sir J. J. Thomson and Sir Philip Watts.

Captain Roald Amundsen, who lectured before the Scottish Geographical Society on November 21, was given the Livingstone Gold Medal of the society.

Professor G. A. Miller, of the University of Illinois, was elected a corresponding member of the Spanish Mathematical Society at its general meeting, held at Madrid, April 26, 1912. The only other corresponding member of this society is M. H. Brocard, of Bar-le-Duc, France.

The governing body of Magdalene College, Cambridge, has awarded a research studentship to Mr. E. Hindle, B.A., Beit fellow, who has been working at pathogenic protozoa in the laboratory of Professor Nuttall.

The annual public address of the Entomological Society of America will be given at the Cleveland meeting of the society on Wednesday evening, January 1, at 8:00 P.M., by Dr. Philip P. Calvert, of the University of Pennsylvania. His subject will be "An Entomologist in Costa Rica." He will give an account of a year spent in this entomologically